

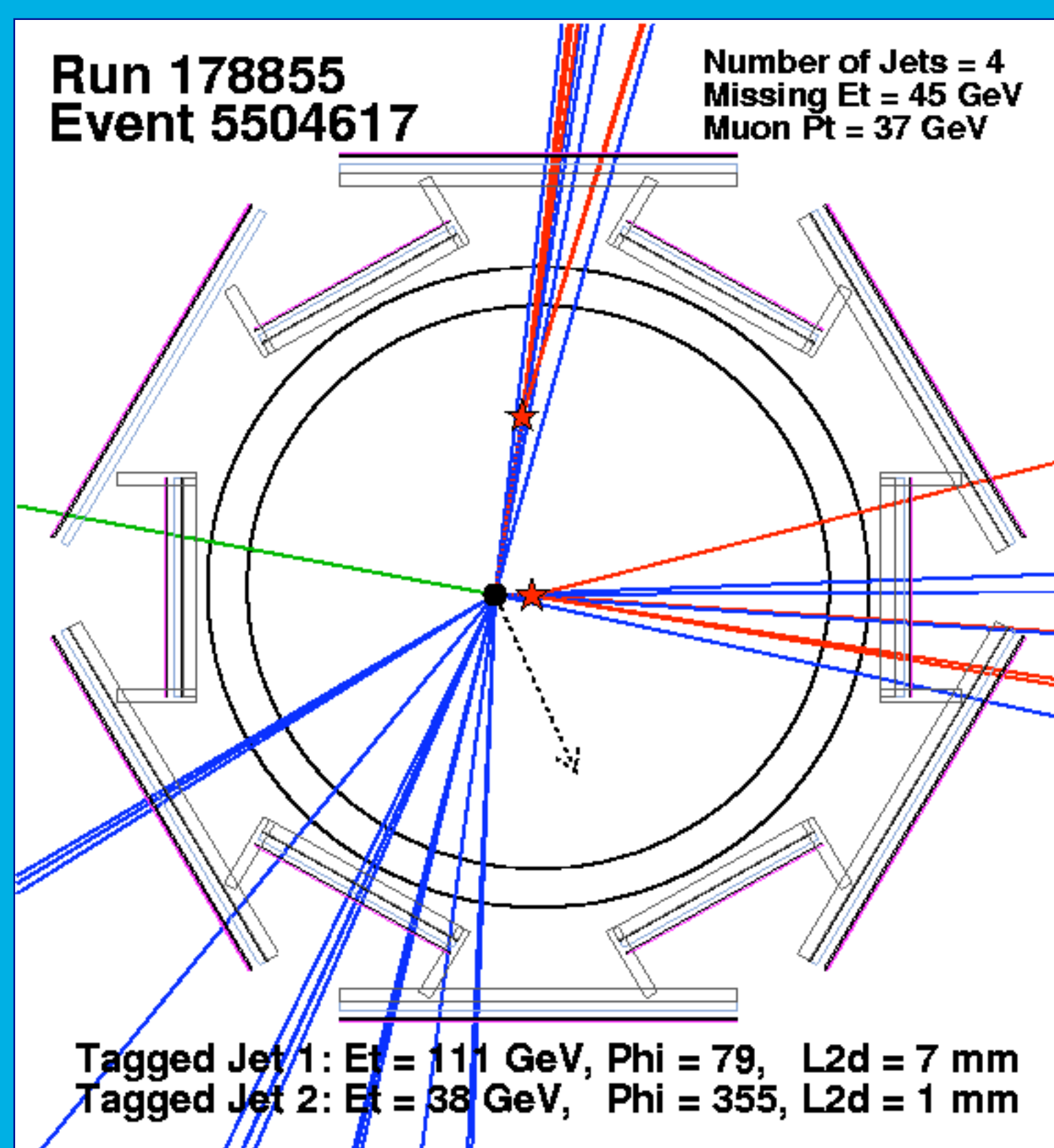
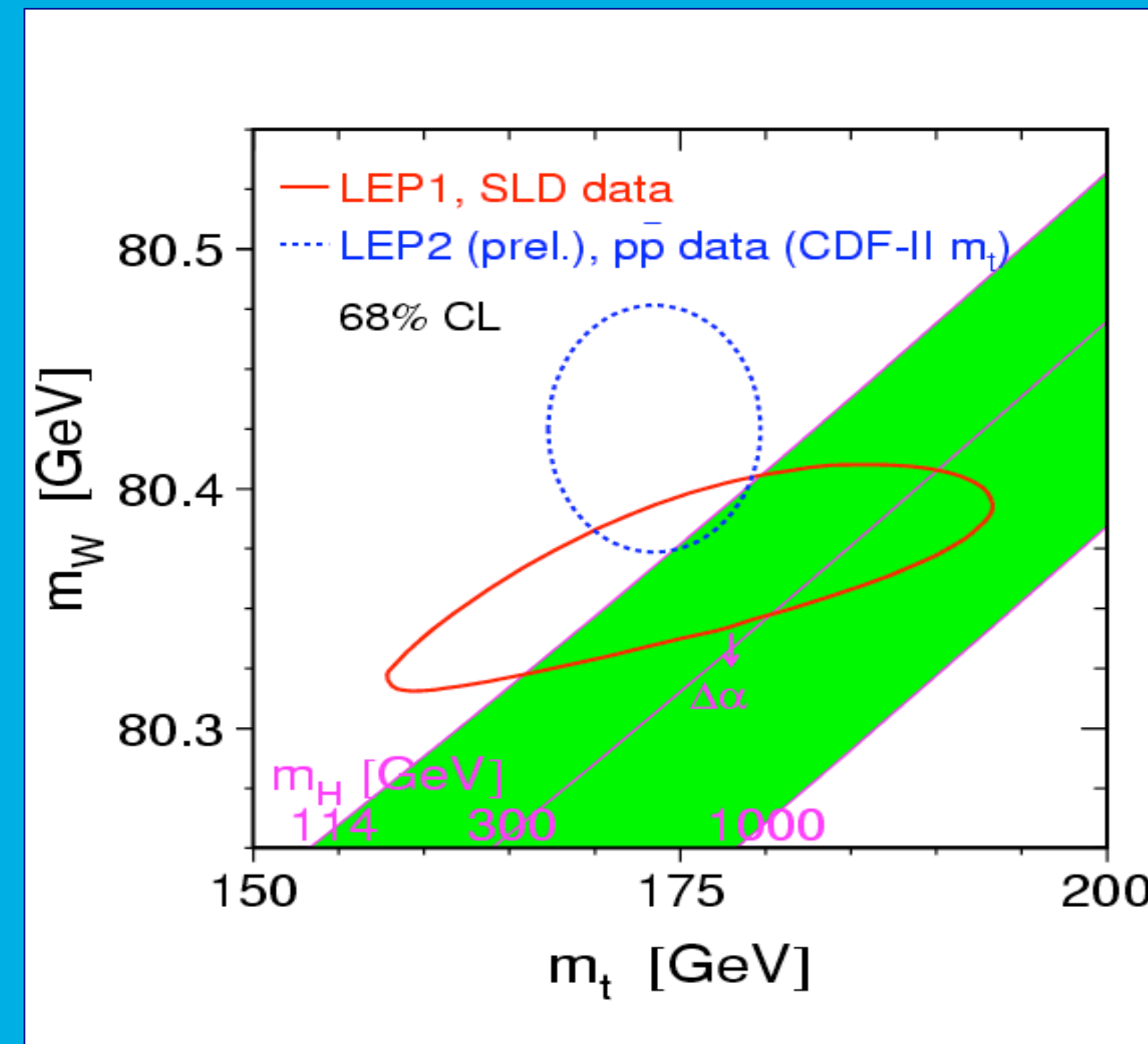


Top Quark Physics at CDF

Physics of the Top Quark

Most massive fundamental particle
Produced only at the Tevatron

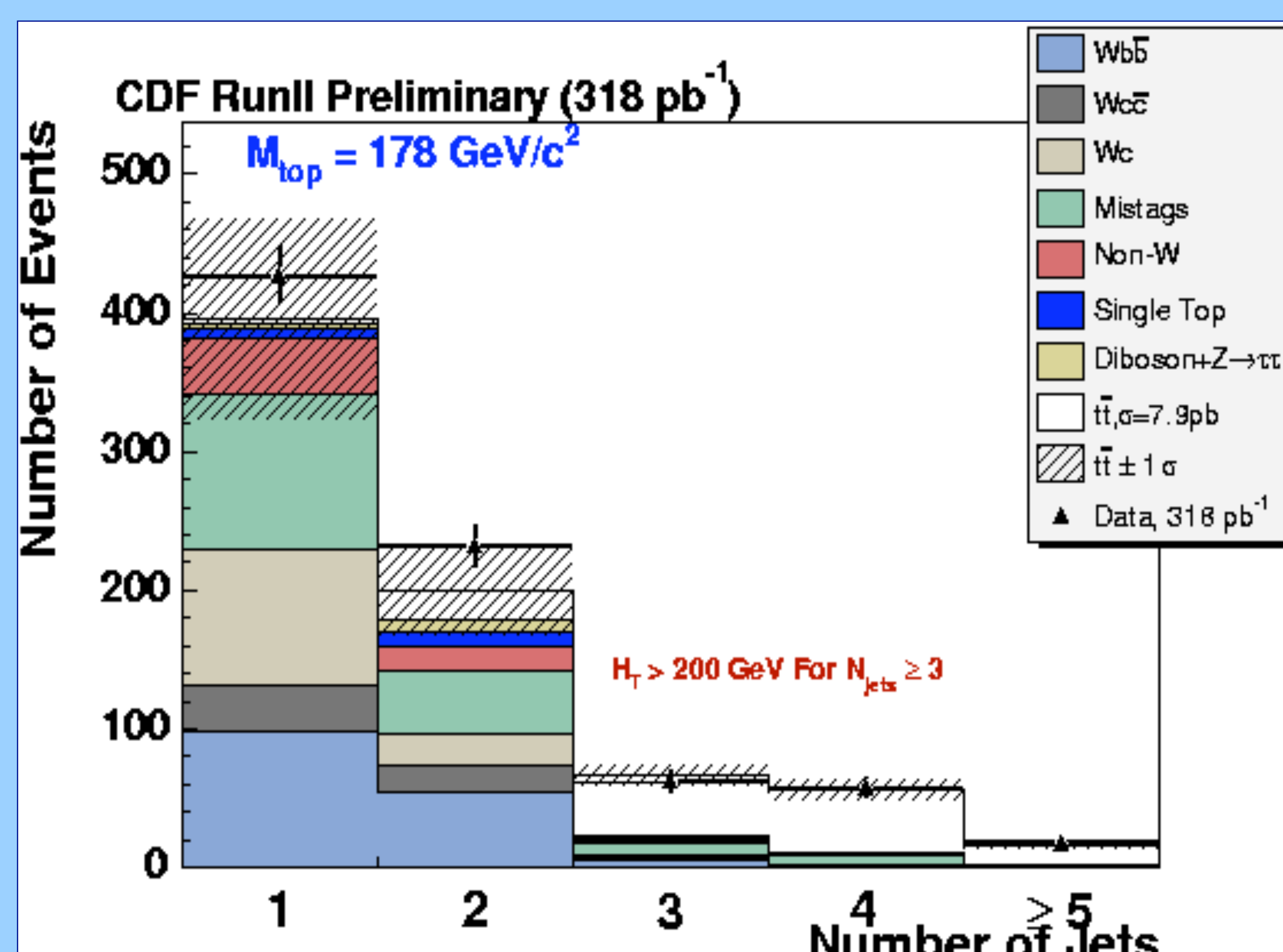
Top quark mass
constrains the mass
of the Higgs boson.



CDF top candidate
event with two
displaced vertex-
tagged jets, muon
from W decay, and
missing energy
(dotted arrow)

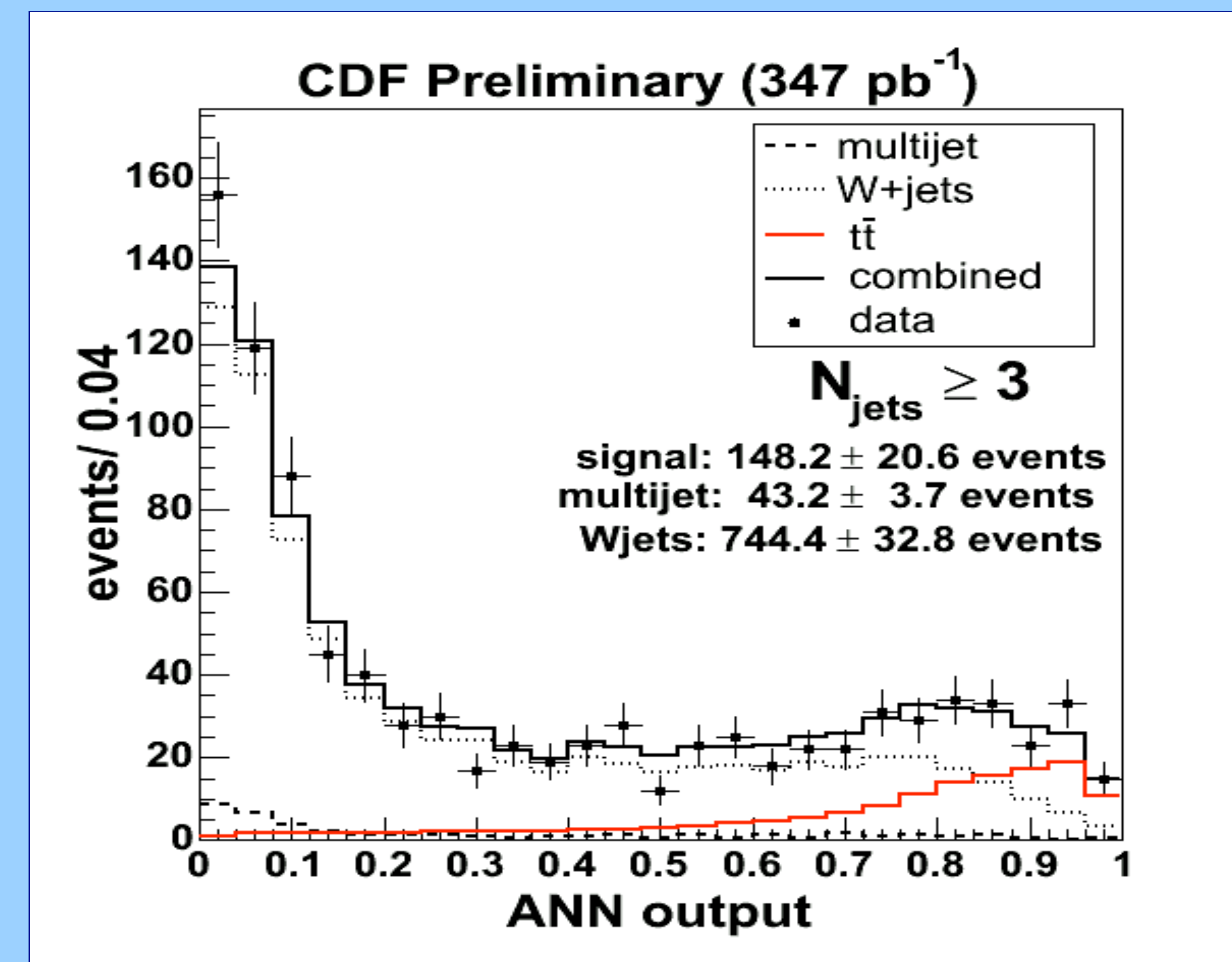
Top cross section using B-tagging

- ✓ Require a displaced secondary vertex tag in the event.
- ✓ Perform counting experiment for tagged events in the ≥ 3 jets data sample, categorized by source.



$$\sigma_{tt} = 7.9 \pm 0.9(\text{stat}) \pm 0.9(\text{sys}) (M_{\text{top}} = 178 \text{ GeV}/c^2)$$

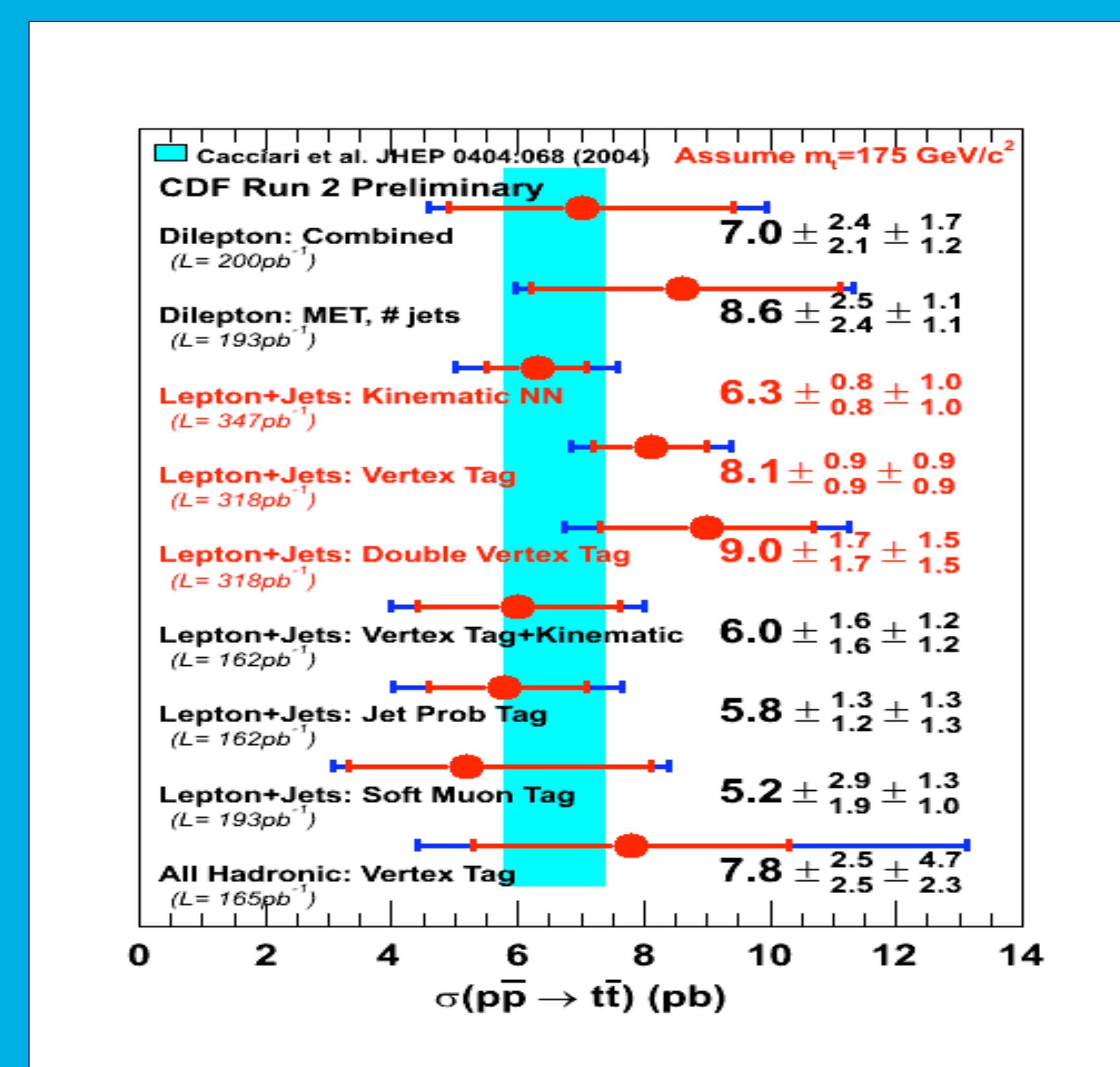
Top cross section analysis using event kinematics



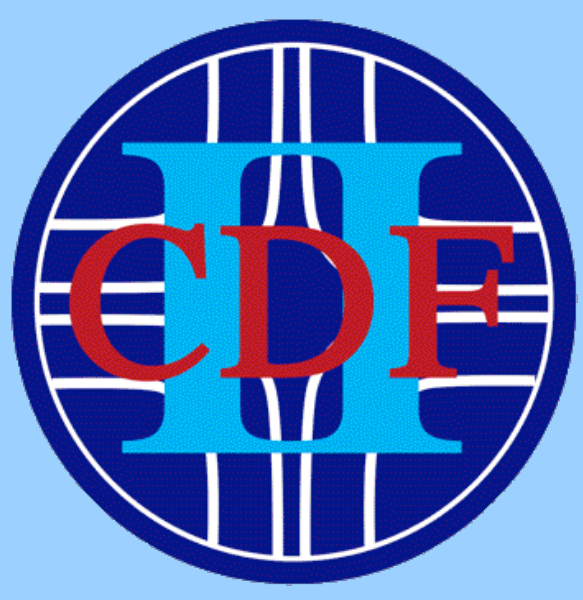
- ✓ Performed in the lepton+ ≥ 3 jets data sample independent of b-tagging.
- ✓ Neural network technique combines information from 7 event variables.
- ✓ Use binned likelihood fit to extract the number of top pair events.

$$\sigma_{tt} = 6.0 \pm 0.8(\text{stat}) \pm 1.0(\text{sys}) (M_{\text{top}} = 178 \text{ GeV}/c^2)$$

CDF Top Cross Section Results Assuming $M_{\text{top}} = 175 \text{ GeV}/c^2$



Improved measurements of top properties
and single-top search results expected
soon !

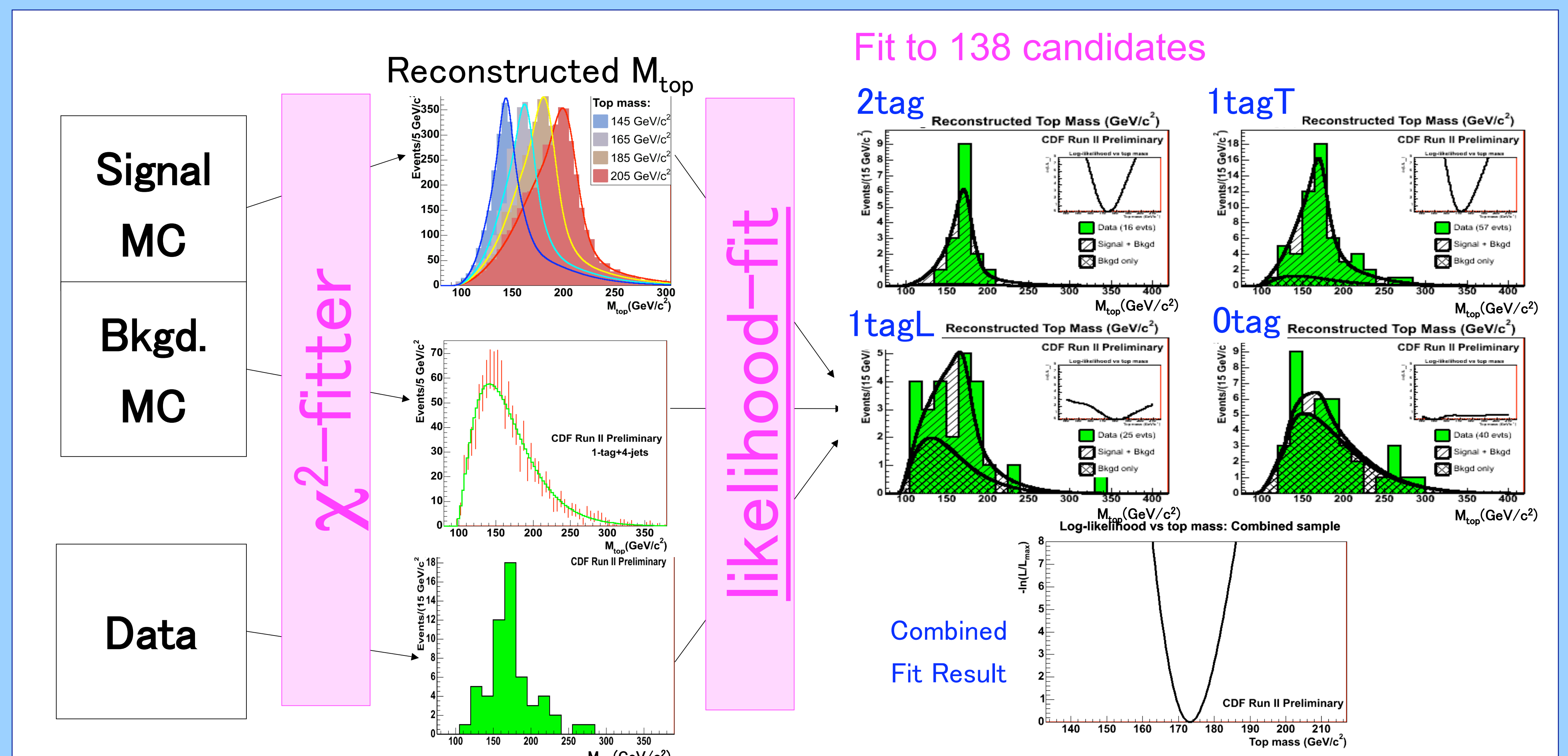


Top Quark Physics at CDF

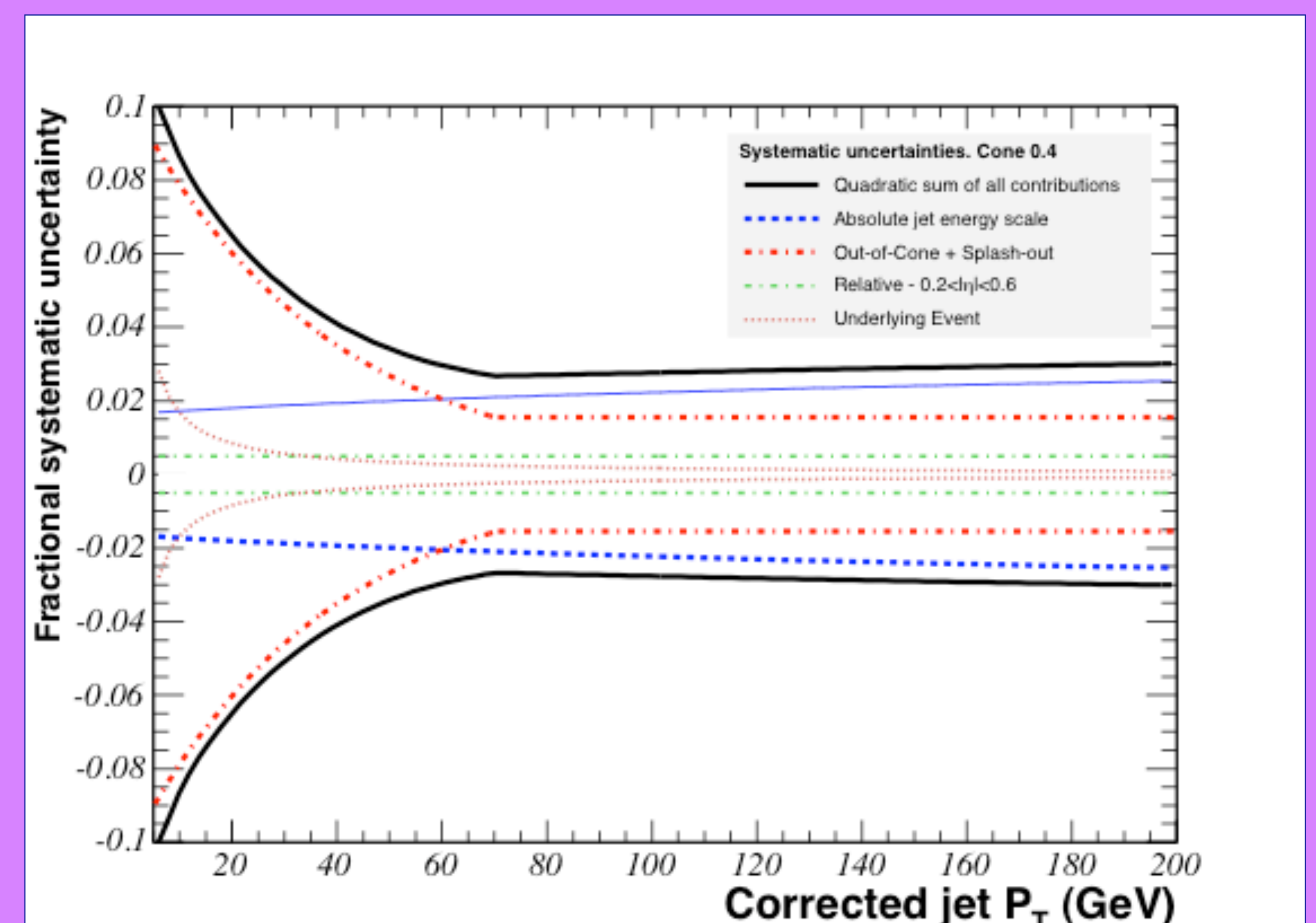
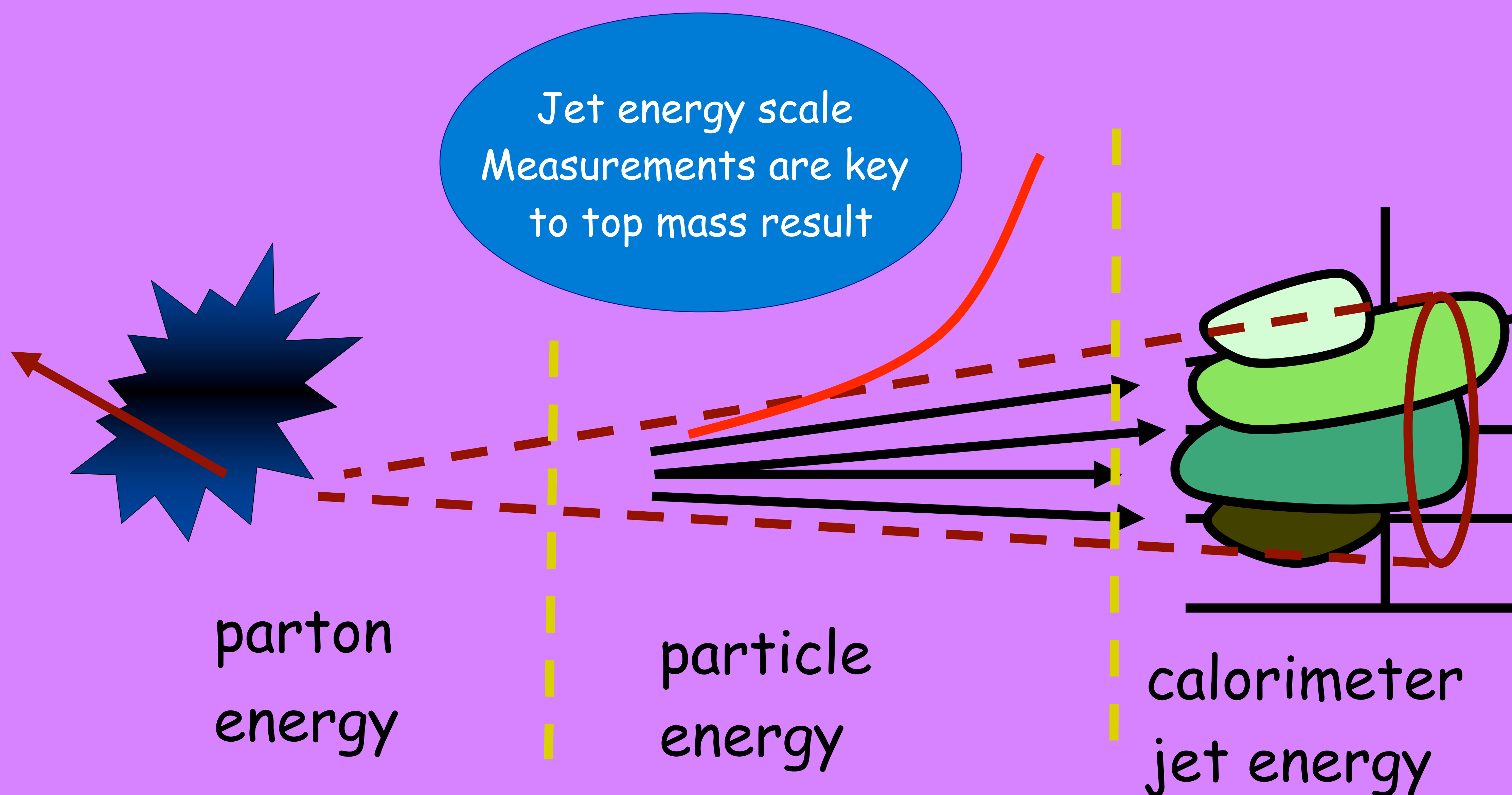
Measurement of the Top Quark Mass

Calculate event-by-event reconstructed top mass

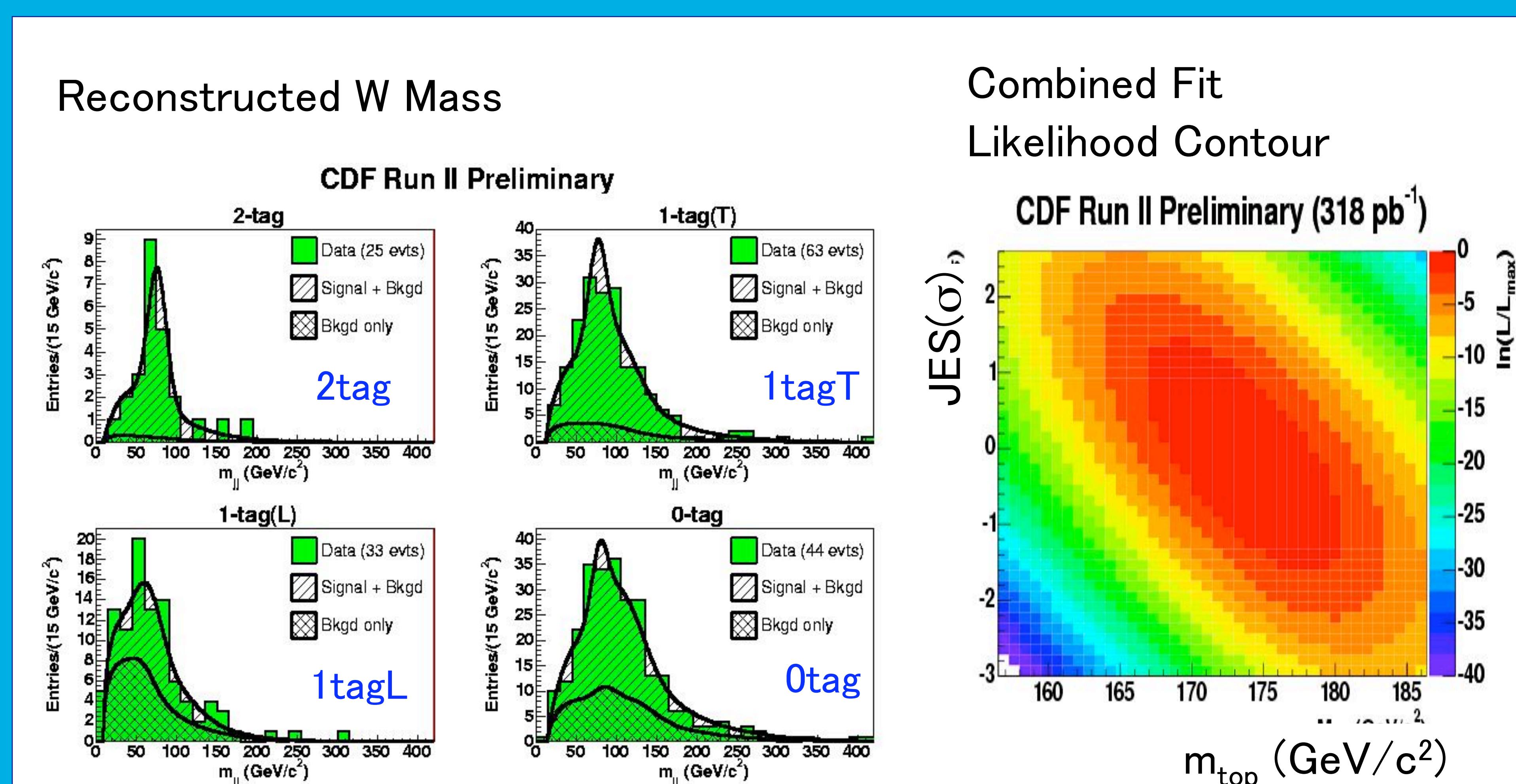
Likelihood fit looks for best top mass and background fraction



$$M_{\text{top}} = 173.2 + {}^{+2.9}_{-2.8}(\text{stat}) \pm 3.4(\text{syst}) \text{ GeV}/c^2$$



Calibrate the jet energy scale with hadronic W mass



$$M_{\text{top}} = 173.5 + {}^{+2.7}_{-2.6}(\text{stat}) \pm 2.5(\text{JES}) \pm 1.7(\text{syst}) \text{ GeV}/c^2$$

CDF Results Surpass Current World Average

